A CONFIRMATION OF THE OLIGODENDROGLIAL ORIGIN OF MYELIN IN THE ADULT RAT

ASAO HIRANO. From the Henry and Lucy Moses Research Laboratory Division, Montefiore Hospital and Medical Center, New York 10467

It is widely held that myelin sheaths in the central nervous system are formed by an oligodendroglial process which wraps itself around an axon (1–5, 9–21). We have, in our own work, assumed this to be the case and, indeed, have presented some indirect evidence that the myelin sheath was, at least at times, connected to a glial perikaryon. This evidence consisted of the presence of formed organelles such as mitochondria and dense bodies within the outer, inner, and lateral loops of the myelin sheath (6–8). In addition, we interpreted the presence of unusually long outer loops as indicating a probable connection to a glial perikaryon (8). Furthermore, it is well known that the cytoplasmic portions of the myelin sheath greatly resemble the cytoplasm of the oligodendroglial cell.

A distinct connection has been convincingly demonstrated in the young, developing animal by Bunge et al. (2) and by Peters (17). In the adult animal, however, a connection between a mature myelin sheath and a glial cell has not been clearly demonstrated. Only a single micrograph occurs in the literature which purports to demonstrate this connection (Fig. 6 in Kruger and Maxwell, reference 9). If this is the only direct demonstra-

FIGURE 1 An oligodendroglial cell at the border of a cystic space in the white matter of an adult rat cerebrum. An apparently mature myelin sheath whose outermost lamella appears continuous with the perikaryon of the oligodendroglial cell is visible in the upper portion of the micrograph. × 25,000.

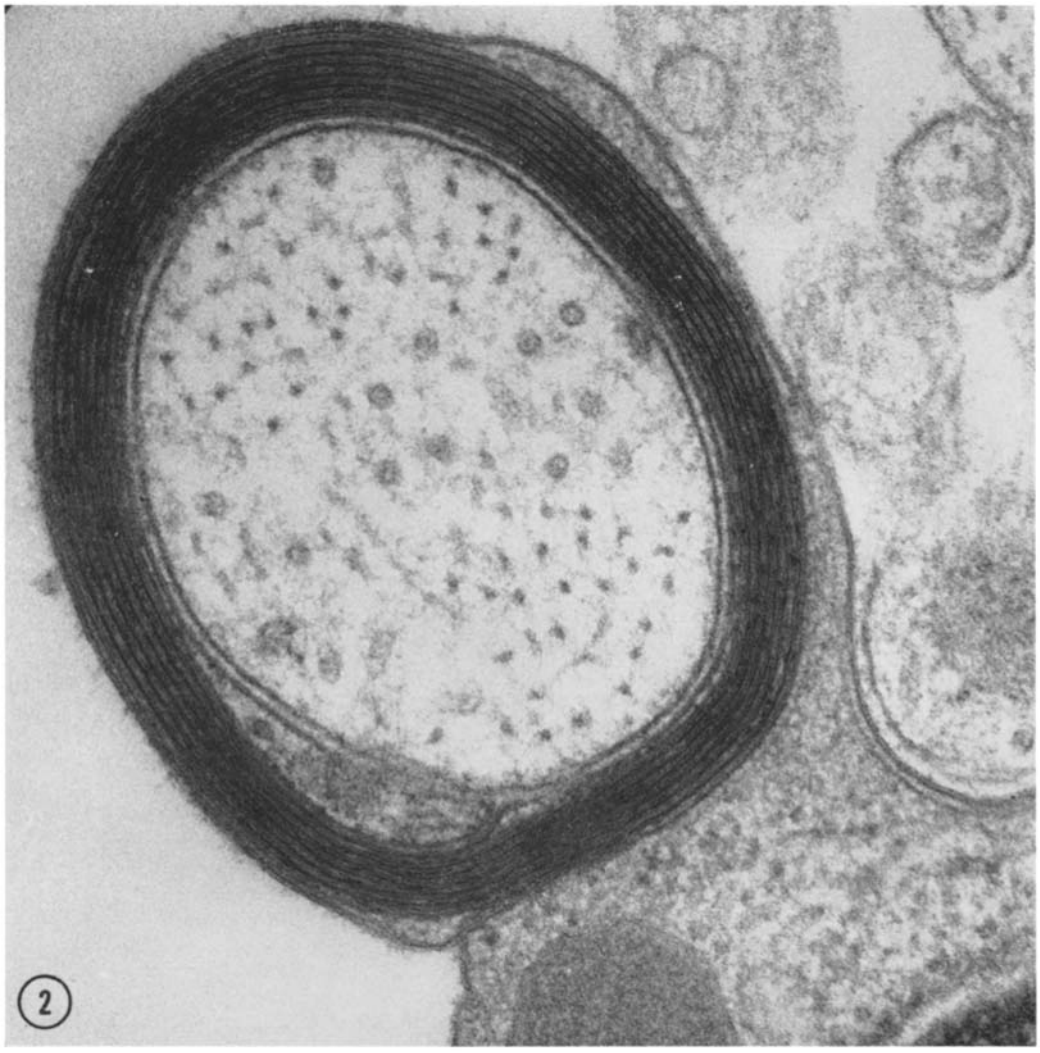

FIGURE 2 A higher magnification of a portion of Fig. 1 showing the continuity between the outermost lamella and the oligodendroglial plasma membrane. × 110,000.

tion of a glial connection to the myelin sheath in the adult animal, as recently stated in an extensive review by Bunge (1), then the evidence for this phenomenon is indeed shaky.

During an experimental study of central white matter in the adult rat, we happened to come across a section which, to our mind, convincingly demonstrates such a direct connection between an apparently mature myelin sheath and an oligodendrocyte (Figs. 1, 2). This material, which had been prepared for electron microscopy by techniques previously described (6–8) was obtained from the edge of a cyst which was formed in the brain of an adult rat 3 wk after the intracerebral implantation of a pellet of triethyltin acetate.

The myelin sheath is apparently mature, but one must bear in mind that it is in an area in which tissue damage had previously occurred. Therefore, one may not exclude the possibility that this configuration is, in fact, a late stage of remyelination. If so, the micrograph offers excellent confirmation of remyelination within the central nervous system. If not, then we have finally, due to a purely fortuitous section, found a direct connection between a mature myelin

sheath and an oligodendrocyte in the adult central nervous system.

This investigation was supported by United States Public Health Service research grant No. B-3533 from the National Institute of Neurological Diseases and Blindness, National Institutes of Health.

Received for publication 13 March 1968.

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